70. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 57, wherein said carbon comprises powder carbon.

71. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 57, wherein said carbon comprises fiber carbon.

REMARKS

1. In response to the rejection of claims 1-66 on grounds of an allegedly defective reissue oath, applicants claim the priority of Japan Patent Application No. 8-107009, filed April 26, 1996. A supplemental application data sheet including that priority claim is submitted herewith. (Applicant notes that the parent U.S. Patent No. 6,007,622 was accorded this priority and that the priority data appears on the front page of that patent.)

2. Applicant thanks the Examiner for his attention to Mr. Molano's Protest of May 8, 2002. Applicant agrees that the reason stated in the section of the Official Action headed "Response to the Protest" is sufficient to justify the conclusion stated there. Applicant submits that the reasons stated in its April 11, 2002 and May 8, 2002 communications also distinguish the reference cited in the Protest, Kremer EP, and that those reasons are not inconsistent with the reason and conclusion stated in denying the Protest in the latest Office Action..

3. In response to the Examiner' Remarks in the Office Action mailed July 16, 2002. we identify in the table below exemplary disclosures in substitute reissue specification, in page/line format, relating to claims 22 - 66 (especially claims 23 – 66, which were not in the original patent). For dependent claims, see also the claims from which they depend. As noted. this identification is exemplary and is not intended to identify all supporting disclosures in the specification.

4. Applicants submit new claims 67 - 71 to more fully claim their invention. The limitations of claims 67 – 71 correspond to those of claims 46, 50, 52, 64 and 66, respectively, but differ in their dependence. The new claims are set forth above in reissue format, with

underlining. For greater legibility during examination, please refer to the table below, which includes the new claims without underlining..

The table identifies exemplary disclosures in substitute reissue specification, in page/line format, relating to new claims 67 - 71. See also the claims from which they depend. As noted, this identification is exemplary and is not intended to identify all supporting disclosures in the specification.

CLAIMS WITHOUT REISSUE-STYLE UNDERLINING	**Page/Line of Exemplary Disclosure in Substitute Reissue Specification (For dependent claims, see also the claims from which they depend)**
22. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 1, carried out such that said carbon-doped compound semiconductor crystal has a variation of carbon concentration of not more than 8 1/3% between a lowest carbon concentration and a highest carbon concentration, relative to said lowest carbon concentration.	This is claim 22 from the original patent. *See also* 13/15-16; 14/5-6, 26-27; 16/16-17
23. A charge for use in vertical boat growth of GaAs single crystal ingots comprising: poly-crystal GaAs material; a source of carbon; and Boron Oxide wherein said source of carbon comprises carbon powder;	9/6-7; 10/30-31; 11/4; Fig. 2 4/21-25; 9/30-10/26 7/5-16; 10/1; 10/20-21

the nominal doping potential of said carbon powder included in the charge is large compared to the planned target level of carbon dopant in an as grown ingot, and said Boron Oxide is provided in an amount for providing spacer material between an as grown ingot and a crucible wall, and between a seed crystal and the bottom of said crucible.	5/21-30; 10/21 10/33-36; Fig. 1
24. A charge in accordance with claim 23 wherein the nominal doping potential of said carbon powder included in the charge is the order of 100 times the planned target level of carbon dopant in an as grown ingot.	5/28-30
25. A charge in accordance with claim 23 wherein the nominal doping potential of said carbon powder included in the charge is at least several times the planned target level of carbon dopant in an as grown ingot.	5/28-30
26. Vertical boat growth of single crystal, semi-insulating GaAs ingots having controlled planned target levels of Carbon therein comprising: (a) loading a crucible with a charge of poly-crystal GaAs material; a source of carbon; and Boron Oxide over a selectively oriented seed crystal;	9/6-7, 10/30-31; 11/4; Fig. 2 4/21-25; 9/30-10/26

(b) placing said crucible in a closed quartz tube;	4/25-27; 5/13-14; 10/9-10
(c) applying a controlled pattern of heating to melt the charge and a portion of the seed crystal to sequentially freeze the melt starting at the interface with the seed crystal to form a single crystal;	6/1-7/3; 10/30-11/4
wherein said source of carbon is carbon powder in a selected quantity having a defined large nominal doping potential compared to the planned target level of Carbon in an as grown ingot; and	5/21-30; 10/21
said Boron Oxide is provided in an amount for providing spacer material between an as grown ingot and a crucible wall, and between a seed crystal and the bottom of said crucible.	10/33-36; Fig. 1
27. Vertical boat growth of single crystal, semi-insulating GaAs ingots in accordance with claim 26 wherein said pattern of heating comprises: heating said charge to the melting point temperature of GaAs; holding that temperature for a period of time.	6/13-14; 6/27-7/3; 10/30-11/1
28. Vertical boat growth of single crystal, semi-insulating GaAs ingots in accordance with claim 26 wherein the nominal doping potential of said carbon	5/28-30

powder included in the charge is the order of 100 times the planned target level of carbon dopant in an as grown ingot.	
29. Vertical boat growth of single crystal, semi-insulating GaAs ingots in accordance with claim 26 wherein the nominal doping potential of said carbon powder included in the charge is at least several times the planned target level of carbon dopant in an as grown ingot.	5/28-30
30. Semi-insulating mono crystalline GaAs material produced in accordance with any of claims 26, 27, 28 or 29.	See claims 26-29; 11/2-4
31. The method of any of claims 1 - 22 wherein sufficient boron oxide substance is placed in said crucible or boat so that the boron oxide substance surrounds the melted semiconductor compound.	10/33-36; Fig. 1
32. The method of claim 31 wherein said melting and solidifying is conducted in a vertical furnace.	9/6-7; 10/30-31; Fig. 2
33. The method of any of claims 1 - 22 wherein said melting and solidifying is conducted in a vertical furnace.	9/6-7; 10/30-31; Fig. 2
34. The method of any of claims 2 – 10 or 18 – 22 wherein said solid carbon is powdered carbon.	7/5-16; 10/1; 10/20-21

35. The method of claim 34 wherein sufficient boron oxide substance is placed in said crucible or boat so that the boron oxide substance surrounds the melted semiconductor compound.	10/33-36; Fig. 1
36. The method of claim 34 wherein said melting and solidifying is conducted in a vertical furnace.	9/6-7; 10/30-31; Fig. 2
37. The method of any of claims 2 – 10 or 18 – 22 wherein said solid carbon is carbon fibers.	7/18-29; 12/9
38. The method of claim 37 wherein sufficient boron oxide substance is placed in said crucible or boat so that the boron oxide substance surrounds the melted semiconductor compound.	10/33-36; Fig. 1
39. The method of claim 37 wherein said melting and solidifying is conducted in a vertical furnace.	9/6-7; 10/30-31; Fig. 2

40. A method of preparing a carbon-doped group III-V compound semiconductor comprising the steps of:	7/14-16, 27-28; 10/30-32, 36-37;
melting a boron oxide substance in contact with carbon, thereby forming a boron oxide - carbon mixture,	12/36-13/3; Fig. 1 (boron oxide has a lower melting temperature than compound GaAs)
heating and melting a III-V compound semiconductor raw material together with said boron oxide - carbon mixture,	10/30-37
maintaining said compound raw material in melted form for a period to permit carbon to migrate from said boron oxide - carbon mixture into said compound raw material, and	6/12-7/3; 11/2-4
solidifying said melted compound raw material to form a crystalline carbon-doped compound semiconductor,	11/1-3
wherein the amount of carbon in the initial boron oxide - carbon mixture is larger than the amount of carbon doped into said compound semiconductor.	5/21-30; 10/21
41. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 40, wherein said boron oxide substance comprises boron oxide and water.	5/16-19
42. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 41,	

wherein said boron oxide substance contains 10-500 wt ppm of said water.	5/16-19
43. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 40, wherein said amount of said carbon in contact with said melted boron oxide substance is at least 10 times larger than said amount of carbon doped into said crystalline semiconductor.	5/28-30
44. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 40, further comprising a step of subjecting solid carbon to a heat treatment under reduced pressure before melting said boron oxide substance in contact with said carbon.	6/1-11; 10/20-23; 12/21-23
45. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 44, comprising carrying out said heat treatment for 1 hour to 12 hours at a temperature of 500° C. – 2000° C. under a pressure of 1 Torr – 1×10^{-8} Torr.	6/1-11; 10/20-23; 12/21-23
46. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 45, further comprising a step of maintaining said melted compound raw material in a	6/12-7/3; 11/1-3

melted state for a certain time period before said step of solidifying said melted raw material.	
47. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 46, wherein said step of maintaining said melted compound raw material in a melted state is carried out for 3 - 72 hours.	6/27-7/3
48. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 40, further comprising selecting a target amount of said carbon to be doped into said compound semiconductor crystal, and adjusting said amount of said carbon in contact with said melted boron oxide substance so as to responsively achieve said target amount of said carbon to be doped into said semiconductor crystal.	5/21-30; 6/21-25; 7/9-8/5; 14/35-37
49. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 40, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
50. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim	

42, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
51. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 40, wherein said carbon comprises fiber carbon.	7/19-29; 12/21-23; 13/26-27; 14/16-17
52. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 42, wherein said carbon comprises fiber carbon.	7/18-29; 12/21-23; 13/26-27; 14/16-17
53. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 40, wherein said compound raw material comprises GaAs, and wherein said compound semiconductor crystal comprises a single crystal of GaAs.	9/30-11/5
54. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, carried out such that said carbon-doped compound semiconductor crystal has a variation of carbon concentration of not more than 8-1/3% between a lowest carbon concentration and a highest carbon concentration, relative to said lowest carbon concentration.	13/15-16; 14/5-6, 26-27; 16/16-17; claim 22 (from original patent)

55. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, wherein said boron oxide substance comprises boron oxide and water.	5/16-19
56. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 55, wherein said boron oxide substance contains 10-500 wt ppm of said water.	5/16-19
57. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, wherein said amount of said carbon in contact with said melted boron oxide substance is at least 10 times larger than said amount of carbon doped into said compound semiconductor crystal.	5/28-30
58. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, further comprising a step of subjecting solid carbon to a heat treatment under reduced pressure before melting said boron oxide substance in contact with said carbon.	6/1-11; 10/20-23; 12/21-23
59. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 58, comprising carrying out said heat	6/1-11; 10/20-23;

treatment for 1 hour to 12 hours at a temperature of 500° C. – 2000° C. under a pressure of 1 Torr – 1×10^{-8} Torr.	12/21-23
60. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, further comprising a step of maintaining said melted compound raw material in a melted state for a certain time period before said step of solidifying said melted raw material to grow said crystal.	6/12-7/3; 11/1-3
61. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 60, wherein said step of maintaining said melted compound raw material in a melted state is carried out for 3-72 hours.	6/27-7/3
62. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, further comprising selecting a target amount of said carbon to be doped into said compound semiconductor crystal, and adjusting said amount of said carbon in contact with said melted boron oxide substance so as to responsively achieve said target amount of said carbon to be doped into said semiconductor crystal.	5/21-30; 6/21-25; 7/9-8/5; 14/35-37
63. The method of preparing a	

carbon-doped group III-V compound semiconductor crystal according to claim 53, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
64. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 56, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
65. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 53, wherein said carbon comprises fiber carbon.	7/18-29; 12/21-23; 13/26-27; 14/16-17
66. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 56, wherein said carbon comprises fiber carbon.	7/18-29; 12/21-23; 13/26-27; 14/16-17
67. The method of preparing a carbon-doped group III-V compound semiconductor according to claim 40, further comprising a step of maintaining said melted compound raw material in a melted state for a certain time period before said step of solidifying said melted raw material.	6/12-7/3; 11/1-3
68. The method of preparing a	

carbon-doped group III-V compound semiconductor crystal according to claim 43, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
69. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 43, wherein said carbon comprises fiber carbon.	7/18-29; 12/21-23; 13/26-27; 14/16-17
70. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 57, wherein said carbon comprises powder carbon.	7/5-16; 10/1; 10/20-21
71. The method of preparing a carbon-doped group III-V compound semiconductor crystal according to claim 57, wherein said carbon comprises fiber carbon.	7/19-29; 12/21-23; 13/26-27; 14/16-17

[Continued on next page]

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Please apply the charge of $90.00 for five new dependent claims to Deposit Account No. 06-1050. Applicant believes that no charges other are due. Please apply any other charges or credits to our Deposit Account No. 06-1050.

Respectfully submitted,

Date: September11, 2002

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